# MOSQUITO GROWTH IN CATCH BASINS.

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Read before American Public Health Association Sanitary Section, September 9, 1915. Received for publication January 19, 1917.

CAMBRIDGE, Massachusetts, is infested with mosquitoes. In the summer months one cannot sit out without the protection of screens without submitting to the annoyance of these buzzing, biting insects. In the regions to the north and west of the city there are swampy districts which abound in breeding places but these are at a distance of a mile to a mile and a half from the center of the city, which is free from any bodies of standing surface water. The regions in question are within a half mile of the Charles River, but as this is a large flowing body of water with clean shores it does not seem that many mosquitoes should arise from this source.

We believe that mosquitoes do not fly to great distances unless carried on the wind. In the case of central Cambridge, therefore, breeding places must be near by to account for the great prevalence of the mosquitoes. A survey of the back yards carried on by the Boy Scouts indicates that the back yards within a half mile radius of the University are reasonably clean and certainly free from tin cans and the sort of rubbish that provides many sources of standing water. To a large extent the houses are in such condition that it is reasonable to suppose that the gutters do not offer sufficiently large breeding places for the numbers of insects present.

A possible source, and by process of elimination the most probable source, is furnished by the catch-basins which are placed at nearly every street intersection to catch the surface drainage from the highways. There are about two thousand such basins in Cambridge scattered over an area of about eight square miles. These basins vary slightly in capacity but have on an average a water surface of 22 square feet. The depth is about 2 feet 4 inches.

In the investigation undertaken to determine what part these basins play in serving as breeding places for mosquitoes there were evidently several points to determine:

*First:* Do these basins serve as breeding places?

*Second:* If they do, do mosquitoes breed in them at all times of the summer season?

*Third:* What effect does rainfall have in changing the water in these basins?

*Fourth:* How can this source be mitigated?

During the summer of 1914 a study was made of eighteen basins situated on various grades of streets. Some were on well traveled, well paved streets; others on streets having a mediocre macadam surface; one on an unaccepted lane at the intersection with a through traffic street.

Through the coöperation of the street department these basins were cleaned by a squad of city workmen in the usual manner during the first few weeks in April. The inlet to each basin was stopped with a plank and the water bailed out with a pail on a rope. A workman in hip boots then descended into the nearly empty basin and removed any accumulation of sticks and leaves or other rubbish from the outlet. The basins of the whole city are thus cleaned once a year as a matter of routine. On April 24 a personal inspection of several of these basins was made.

The outlet to the sewer from these basins is in all cases through some sort of trapping device which allows water from below the surface to flow out and which carries out the surface water only as it is displaced and mixed with the lower layers by incoming drainage.

The procedure followed in the investigation consisted of taking a measured sample from each basin in such a manner as to include only surface water insofar as possible, and transporting it to the laboratory where it was transferred to a battery jar for observation. It was felt that, inasmuch as the mosquito larvæ when undisturbed remain for the most part at the surface of the water, such a sample when examined for the presence of these wrigglers would give a fair indication of the number breeding in each catch-basin at the times of sampling. If these periods of sampling could be so arranged as to occur once per generation of mosquitoes, the season's catch would give an approximate comparative computation of the number breeding in the various basins throughout the season.

Various sampling devices were tried, each designed to take surface water only and to take the sample quickly. At first attempts were made to take a large quantity of water and strain it through cloth to concentrate the sample. This was impractical because of the large mass of rubbish always present which collected on the strainer, effectually hiding any mosquitoes or larvæ. Finally a tin can on a stick was adopted as the best sampler.

The man-hole cover was lifted off and a few seconds allowed for things to quiet down. The sampler was then lowered quietly to near the surface of the water and quickly plunged under to a certain mark and swept with the same motion in a lateral direction. By this means the sample taken was of surface water largely and there tended to sweep in with it any floating matter which was reached by the current created, including of course mosquito larvæ, eggs, and pupæ.

Later it was observed in a glass vessel that mosquito larvæ come up principally around the edges, so that a preliminary stirring up of the water in the basins was resorted to, to scatter the wrigglers, followed by a period of quiet long enough to allow the larvæ to return to the surface. From time experiments in the laboratory it was found that the larvæ stay under only for a short time when suddenly frightened, at most not more than 60 seconds, and usually not more than 30 seconds. At least a minute, therefore, was allowed to elapse between stirring up the water and taking the sample.

One half gallon samples were taken in this manner and transported to the laboratory in glass stoppered bottles in cloth bags. Notes were taken of the appearance of each basin during the short interval of waiting.

At the laboratory each sample was emptied carefully into a numbered battery jar and observed once a day for the appearance of larvæ or pupæ and the number recorded. Netting over the top of the jars served to entrap any insects that hatched out between periods of observation. Corrections were made for instance when a larva changed into a pupa or a pupa into an imago and in this way the corrected larval total for the week was taken as the index of the number of mosquitoes that would have hatched from that sample of water that week. It was judged that any eggs laid soon after the taking of a sample would appear in the next week's catch. From observations made in the laboratory it was assumed that the average time from egg to imago was on an average about seven or eight days, rather than the longer period of ten days more often assigned to this phenomenon in the literature. It was evident that seven days is sufficient time to carry the egg to the larval stage and to carry the young larvæ to the imago stage.

Inasmuch, therefore, as this work consisted in an enumeration of larvæ, largely, it was considered satisfactory to allow a period of time to elapse between samples sufficient to graduate the larvæ of one sampling period to the imago stage before taking the next sample. One week was, therefore, adopted as a convenient and suitable period of sampling. The method of computation adopted was considered to be accurate enough, considering the many possibilities of error in the procedure, to give at least a comparative result from week to week and between basins under various conditions.

A tabulation of the season's catch with the rainfall record of each preceding week and a daily temperature record was made at the end of the work.

On May 4, after six days of dry weather, the first catch of the season was made. One larvæ was captured in one basin. This was computed to represent twenty-two larvæ in that basin. The mean temperature was about 60° on that day.

No more wrigglers were captured until May 27 when larvæ were found in five basins. This was at the end of a hot, dry week and the temperature on the day of sampling was from 74 to 95. From 40 to 350 larvæ were indicated in each basin that yielded any at all.

The following sample day was cold again having a mean temperature of 60° and followed three rainy days, the heaviest fall being the morning of the sampling day and consisting of a smart shower with a precipitation of .1 inch. No larvæ were captured in any basin.

On June 10 three basins showed the presence of mosquitoes, and following that date, until July 29, only one basin yielded any at all, that one basin never failing to give a crop of from 30 to 150 per week as indicated by our method of sampling.

On July 29 seven basins showed the presence of wrigglers, and all during the month the crop was fairly heavy. Temperature ran high and the showers occurred for the most part early in the sampling week or not at all.

With the beginning of the month of September, for no evident reason, the number of basins yielding mosquitoes dropped to one and the number in that to one.

On September 16 the last larva was captured and on September 29, after two blank weeks, as the temperature was down to 46 the hunt was declared off.

It was found that we had direct evidence of the breeding of some 5,500 mosquitoes from eighteen basins of which 1,300 were from one basin alone. One basin failed to yield any during the run and one basin yielded only one for the season.

The total number did not at all fit with preconceived ideas and in the opinion of the author is not trustworthy as an indication of the quantity that actually were bred, because of the many chances for error in sampling.

There are, however, certain inferences to be drawn from the results obtained which are suggestive. One basin was a consistent producer of mosquitoes throughout the test and never failed to produce larvæ if any other basin did. When no larvæ were found in this basin, none were found anywhere else. The notes of the observer, taken at times of sampling, seemed to give the answer to the question raised by this apparent abnormal condition, and information from the street department was corroborative of the explanation deduced.

All the streets in the neighborhood under investigation are in the summer time oiled to keep down the dust. Inasmuch as the street surfacing of Cambridge is, for the most part, macadam there is considerable dust to keep down. Consequently the streets are oiled early and often during the summer. Naturally the city does not go to the expense of oiling any unaccepted streets.

The basin which yielded the steady crop of mosquitoes was on an unaccepted street. The other basins were on accepted city streets. The note book record of observations shows that in all the cases, except the one prolific basin mentioned, there was usually evident upon the surface of the water in the catch basins a more or less thick oily scum. The basin which supplied the mosquitoes did not have such a scum. It was reasonable to suppose that this scum comes from the excess oil which runs off or which is washed off the roadway into the basins. Apparently the catch basins in Cambridge are, for the most part, kept automatically oiled by the street department, and where such is the case they do not serve as breeding places for mosquitoes to such an extent as they otherwise would.

### Conclusions.

The conclusions which may be drawn from this investigation are as follows:

(1) Under ordinary conditions catch basins can and do serve as breeding places for mosquitoes.

(2) Depending on the season, mosquitoes may be expected to breed in catch basins in places of the same climatic conditions as Cambridge, Mass., from May to September.

(3) A sufficient amount of rainfall serves to wash out the basins to some degree and rid them of eggs and larvæ. This need be only .1 inch of precipitation if it be brisk.

(4) It is evident that oiling is efficient in reducing the number of mosquitoes coming from this source, and it appears that in some cases oiling of the streets to keep down the dust serves automatically to oil the catch basins.

Received for publication Jan. 19, 1917.

## BRITISH MEDICAL PROFESSION APPROVES HEALTH INSURANCE.

How does the medical profession in England, after five years' practical experience, regard the Health Insurance Act? "Favorably," finds the British Medical Association after a painstaking inquiry among all local branches and panel committees. And, the Association's Committee remarks, "the degree of unanimity so far disclosed is somewhat remarkable."

The report, which has appeared in the *British Medical Journal*, points out minor defects in administrative detail that may be easily corrected and suggests that the scheme, which is proving a distinct gain to the medical profession as well as to the public health, be still further expanded.

The most important improvements recommended by the Committee and adopted at the Annual Representative Meeting of the Association relate to provisions not found in the existing British Act but contained in the tentative health insurance bill prepared by the American Association for Labor Legislation in coöperation with the American Medical Association, and now being studied by official commissions in eight states in this country with a view to legislation. These provisions, now found desirable by the British doctors, include the extension, under certain conditions, of the advantage of medical care to dependents of insured persons, and also the extension of the scope of medical benefit to provide *all* necessary medical care—specialists and nursing services, institutional treatment, maternity attendance, etc.,—instead of only that which can be furnished by the general practitioner.

Perfection of the existing panel plan and of the basis of payment for medical service is recommended, as against any immediate consideration of a new system in the direction of a state medical service, though the Association recognizes the need for an extension of the number of salaried medical officers in the field of preventive medicine.